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MEMORANDUM CH2MHILL

Amy reviewing 2/6/95 - will do by end of Feb.

TO: Pat Young/USEPA

COPIES: Amy Wagner/USEPA (w/ attachments)
Norman Wei/StarKist Foods (w/attachments)
James Cox/Van Camp Seafood (w/attachments)
Sheila Wiegman/American Samoa EPA (w/attachments)
Kurt Kline/ABT (w/o attachments)

FROM: Steve Costa/CH2M HILL/SFO
Karen Glatzel/Glatzel & Associates

DATE: 26 January 1995

SUBJECT: **Bioassay Testing of High Strength Waste: Starkist Samoa, Inc. and VCS Samoa Packing**

PROJECT: OPE030702.DS.BT

Three sets of bioassay tests with high strength waste (HSW) are required by Special Condition 3.3.5 of Starkist Samoa's and VCS Samoa Packing's ocean dumping permits. The results of the second set of tests are presented in the attached: "*Results of a Bioassay Conducted on Two High Strength Waste Samples from the Van Camp and Starkist Tuna Canneries in American Samoa*" prepared by Advanced Biological Testing Inc. (ABT), Tiburon, California, dated November 21, 1994 (Attachment No. 1). The second sampling was conducted on 20 October 1994 and sampling procedures are provided as Attachment No. 2.

Acute effluent bioassays were conducted on *Mysidopsis bahia* (mysid shrimp) juveniles, *Mytilus edulis* (blue mussel) larvae, and *Citharichthys stigmaeus* (speckled sanddab) juveniles using HSW collected separately from the Starkist Samoa and VCS Samoa Packing canneries in Pago Pago Harbor, American Samoa. The results of these bioassays are summarized in the table below. Test results from the first set of tests (16 February 1994 sampling) are included in the table for comparison.

After the first set of tests CH2M HILL and ABT recommended a number of changes to the HSW test protocol (Attachment No. 3). U.S. EPA's response to the recommendations is provided in Attachment No. 4. The recommendation for reducing the maximum concentrations of the samples was accepted by U.S. EPA and after consultation between ABT and EPA new test concentrations were established for the mysid, mussel, and sanddab tests of 2.0, 1.0, 0.5, 0.25, 0.125, and 0.06% as a volume dilution in 30 ppt seawater. The recommendation for dropping the urchin test was accepted by U.S. EPA. The mussel test was continued to investigate the effects of aeration as described below.

In the first test (2/94) it was determined that due to the high oxygen demand, including a high immediate oxygen demand, of the effluent all test containers required aeration

throughout the tests to maintain adequate oxygen concentrations. Aeration is standard protocol for bioassays on fish and invertebrates when oxygen levels fall below 40% of saturation, but is not standard protocol for bioassays on larval bivalves and echinoderms. Therefore, aerating the chambers containing *Mytilus edulis* may give problematic results.

In the second test (October 1994 sampling) gentle aeration was initiated on Day 0, and continued for the duration of the tests. To assess the effects of aeration, an aeration control for the mussel test was run simultaneously. No statistical differences were observed between aerated and unaerated controls. It is now recommended that this type of aeration continue to be used with the mussel test to determine if a permanent change in the protocols for these samples should be made regarding aeration.

After review of the test results, we suggest Amy Wagner contact Kurt Kline, Advanced Biological Testing Inc., directly at (415) 435-7878 to discuss any comments on the bioassay tests or the test protocols. Please contact Steve Costa, at (510) 251-2888 ext 2251, if there are any additional questions regarding this memo.

Summary of High Strength Waste Bioassay Results.

Test Organism	Endpoint	Starkist Samoa		VCS Samoa Packing	
		2/94	10/94	2/94	10/94
Citharichthys stigmaeus (sanddab)	LC_{50}	0.27%	0.35%	0.59%	0.37%
	NOEC	0.20%	0.25%	0.40%	0.25%
	LOEC	0.40%	0.50%	0.80%	0.50%
Mysidopsis bahia (mysid shrimp)	LC_{50}	0.12%	1.16%	0.59%	0.79%
	NOEC	0.05%	0.50%	0.05%	0.50%
	LOEC	0.10%	1.00%	0.10%	1.00%
Mytilus edulis (blue mussel)	LC_{50}	>1.20%	>2.0%	>1.20%	>0.20%
	IC_{50}	<0.08%	0.10%	<0.08%	0.18%
Strongylocentrotus pupuratus (urchin)[1]	LC_{50}	1.20%	-	1.20%	-
	IC_{50}	<0.08%	-	0.10%	-

[1] Urchin test not conducted in 10/94 test period as per direction from U.S. EPA.